International Commission for the Northwest Atlantic Fisheries

Serial No. 3813
(D.a.75)

ICNAF Summ.Doc. 76/VI/16

ANNUAL MEETING - JUNE 1976

United States Research Report, 1975

by

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The United States landed fish from ICNAF Subareas 4 and 5 and Statistical Area 6. Research was conducted in Subareas 3, 4, and 5, and Statistical Area 6. Table 1 gives a summary of US finfish and sea scallops nominal catches for 1974 and 1975.

Table 1. United States finfish and sea scallops nominal catches for 1974 and 1975 (metric tons, round fresh).

Species	Year	Subarea 4	Subarea 5	Subarea 6	Total
Haddock	1974	675	3034	-	3709
	1975	2162	5166	-	7328
Cod	1974	412	25290	61	25763
	1975	497	23916	418	24831
Redfish	1974	9928	8690	-	18618
	1975	5464	9075	1	14540
Pollock	1974	677	7719	4	8400
	1975	741	8189	4	8934
Yellowtail	1974	5	24160	1777	25942
	1975	63	20138	532	20733
Other flounder	1974	83	12640	6234	18957
	1975	120	15968	7848	23936
Silver hake	1974	-	9535	4686	14221
	1975	7	16187	4701	20895
Red hake	1974	-	1887	822	2709
	1975	3	1760	724	2487
Sea herring	1974	-	32392	278	32670
	1975	-	35681	478	36159
		-			
Mackerel	1974	-	428	565	993
	1975	-	547	1113	1660
River herring[1]	1974	-	1589	15186	16775
	1975	-	2568	8190	10758
Menhaden	1974	-	38073	211000	249073
	1975	-	26465	167926	194391

Table 1. (Continued)

Other finfish	1974	876	21583	30919	53378
	1975	839	15649	29970	46458
Total finfish	1974	12676	185119	291650	489445
	1975	9896	181309	221905	413110
Sea scallops	1974	-	9609	13067	22676
	1975		13754	20956	34710

[1]Alewife and blueback herring.

Subarea 3

B. Special research studies

The US Coast Guard conducted oceanographic surveys in support of the International Ice Patrol in Div. 3N, L, and O.

Subarea 4

A. Status of the fisheries

1. Haddock

The US nominal catch of haddock from Subarea 4 increased sharply in 1975 to the largest amount since 1968 (Table 2). The research vessel survey index of young of the year and the landings per day fished also increased.

Table 2. US haddock statistics, Div. 4X (metric tons, round fresh).

	Division 4X		Browns Bank		
Year	Landings	YOY Survey[1] Index	Landings	Days fished	Landings/days fished
1966	2,473	1.32	939	200	4.7
1967	5,014	1.10	2,059	381	5.4
1968	3,156	1.51	2,278	506	4.5
1969	1,830	3.31	1,305	389	3.4
1970	1,744	1.03	1,576	493	3.2
1971	751	6.08	605	242	2.5
1972	448	2.28	387	117	3.3
1973	269	1.83	268	107	2.5
1974	670	2.90	648	-[2]	-[2]
1975	2,142	4.52	2,098	477	4.4

[1]Mean catch per haul (linear scale retransformed from $\log_{10}$ scale).
[2]Landings/day not calculated due to 10% trip limitation.

2. Cod

The US fleet landed 497 tons of cod from Subarea 4 in 1975, 85 tons more than in 1974.

3. Redfish

There were no US landings of redfish from the Gulf of St. Lawrence (Div. 4R, S, and T). Landings from the Scotian Shelf (Div. 4V, W, and X) dropped because of reduced effort (Table 4). The catch per unit of effort dropped slightly but the research vessel survey index showed a 35 percent increase.

Table 3. US redfish statistics, Div. 4R, S, and T (metric tons, round fresh).

Year	Landings	Days fished	Landings/days fished
1966	12,766	608	21.0
1967	15,482	622	24.9
1968	16,437	740	22.2
1969	12,122	689	17.6
1970	7,592	593	12.8
1971	4,706	490	9.6
1972	1,111	104	10.7
1973	1,638	144	11.4
1974	1,031	104	9.9
1975	-	-	-

Table 4. US redfish statistics, Div. 4V, W, and X (metric tons, round fresh).

Year	Landings	Days fished	Landings/days fished	Survey wt/tow[1]
1966	16,680	1,183	14.1	20.2
1967	6,407	593	10.8	33.4
1968	4,635	297	15.8	15.3
1969	1,142	75	15.3	42.6
1970	1,949	135	14.2	50.4
1971	6,261	404	15.5	39.7
1972	12,365	840	14.7	25.7
1973	11,290	965	11.7	38.6
1974	8,897	780	11.4	16.1
1975	5,464	547	10.0	21.8

[1]Weight in pounds.

B. Special research studies

Research and environmental studies in Div. 4X are part of a larger program carried out in Subarea 5 and Statistical Area 6. They are reported under Subarea 5.

Subarea 5 and Statistical Area 6

A. Status of the fisheries

1. Haddock

Haddock landings from Subarea 5 in 1975 were again limited by quota regulations set by the Commission, and US vessels landed 5,166 tons (Table 5).

Table 5. US haddock statistics, Subarea 5 (metric tons, round fresh).

Year	Subarea 5 landings	Div. 5Y landings	Div. 5Zw landings	Div. 5Ze	
				Landings	Adjusted landings/ standard day fished (MT, landed wt)
1966	57,497	4,579	31	52,887	5.27
1967	39,580	4,852	37	34,691	4.02
1968	28,887	3,418	16	25,453	3.11
1969	18,858	2,402	15	16,441	2.47
1970	9,872	1,457	15	8,400	1.82
1971	8,500	1,194	5	7,301	1.72
1972	4,771	901	3	3,867	1.77
1973	3,314	526	3	2,785	0.96
1974	3,034	628	2	2,404	-[1]
1975	5,166	1,180	17	3,969	-[2]

[1]Landings/day not calculated due to 10% trip limitation.
[2]Landings/day not calculated due to varying incidental haddock catch limitations.

The 0-group index for haddock was the highest since 1963.

Table 6. US research vessel index of relative year-class abundance of Georges Bank haddock based on autumn catches of 0-group fish.

Year	Index	Year	Index
1959	9.6	1967	1.0
1960	2.4	1968	1.0
1961	1.4	1969	1.1
1962	2.6	1970	1.0
1963	12.6	1971	1.4
1964	2.0	1972	2.0
1965	1.2	1973	1.8
1966	1.7	1974	1.3
		1975	3.8

2. Cod

US landings of cod from Subarea 5 in 1975 dropped slightly (Table 7). Total catches by all countries in recent years have been high, exceeding or being close to the sustainable yield. US commercial landings per day fished from Georges Bank have increased since 1968; however, this is probably a reflection of change in fishing practices (i.e. a greater directed fishery for cod in the absence of haddock). The research survey index increased somewhat.

Table 7. US cod statistics, Subarea 5 (metric tons, round fresh).

Year	Subarea 5 landings	Div. 5Y landings	Subdiv. 5Zw landings	Subdiv. 5Ze		
				Landings	Landings/ days fished	Survey wt./tow[1]
1966	15,343	4,008	345	10,990	1.1	11.1
1967	18,057	5,527	684	11,846	1.0	18.5
1968	21,045	6,360	836	13,849	1.4	11.7
1969	24,175	7,823	1,143	15,209	1.6	10.9
1970	22,347	7,812	1,182	13,353	2.1	17.1
1971	23,175	7,380	796	14,999	2.0	13.4
1972	19,704	6,564	662	12,478	2.6	31.3
1973	22,001	6,063	1,092	14,846	4.2	42.0
1974	25,290	7,426	1,220	16,645	3.9	11.2
1975	23,915	8,676	644	14,594	3.8	19.1

[1]Weight in pounds.

3. Silver hake

Total US silver hake landings from Subareas 5 and 6 in 1975 increased from 14 thousand metric tons in 1974 to 21 thousand metric tons (Table 1). Landings per days fished indices (Table 8) in each area also showed an increase over the previous year. In Division 5Y landings and effort data of class 2 vessels (0-50 tons) indicate increased abundance after a continual decline since 1966. Catch/effort indices for Division 5Ze, from landings and days fished data of class 3 vessels (51-150 tons), also increased from 15.0 in 1974 to 22.7 in 1975. Commercial abundance indices obtained from landings and days fished data of class 2 vessels fishing in depths less than 56 meters in Divisions 5Zw and 6A increased from 4.3 in 1974 to 5.7 in 1975.

US silver hake abundance indices from survey cruise data (Table 9) increased in all areas in 1975, after a decrease in 1974, indicating the possibility of stock recovery in the future.

Table 8. US silver hake statistics, Subareas 5 and 6 (metric tons, round fresh).

Year	Div. 5Y		Div. 5Ze		Div. 5Zw and 6				
					Food landings			Industrial landings	
	landings	landings/ days fished	landings	landings/ days fished	5Zw	6A[1]	landings/ days fished	5Zw	6A
1966	21,323	18.2	16,222	26.1	3,281	5	4.6		
1967	14,390	17.1	12,692	31.8	607	3	5.2	3,297	
1968	24,706	17.8	6,451	25.3	1,221	24	5.3	3,541	
1969	14,609	10.1	1,654	13.3	1,429	49	6.2	2,809	372
1970	11,384	7.7	4,238	23.8	2,441	112	7.7	1,218	114
1971	8,263	8.6	3,169	17.4	1,069	259	4.9	923	240
1972	5,548	7.1	979	8.7	1,499	235	6.2	117	48
1973	8,348	9.9	5,704	22.6	1,129	268	4.8	795	99
1974	4,634	6.3	2,285	15.0	1,946	383	4.3	669	91
1975	8,042	7.8	4,588	22.7	1,999	4,162	5.7	1,522	208

[1]Prior to 1975, most SA 6 landings were reported as 6NK only.

Table 9. Silver hake abundance indices (mean catch/tow in pounds) from US survey cruises.

Year	Div. 5Y (Gulf of Maine) Spring	Fall	Subdiv. 5Ze (Georges Bank) Spring	Fall	Subdiv. 5Zw - Div. 6A (So. New England) Spring	Fall
1963	-	58.3	-	7.9	-	11.5
1964	-	10.3	-	2.8	-	12.5
1965	-	17.4	-	3.3	-	16.8
1966	-	9.4	-	3.3	-	7.9
1967	-	5.3	-	2.3	-	9.8
1968	.1	4.2	.8	5.5	16.2	10.5
1969	.4	5.4	1.2	3.7	8.4	5.1
1970	.7	6.6	1.6	2.8	3.7	5.7
1971	.8	6.1	1.7	2.7	8.2	10.1
1972	3.8	14.3	1.1	3.0	5.1	8.8
1973	1.6*	9.2	1.8*	3.8	2.6*	7.1
1974	1.6*	8.3	.7*	2.4	3.7*	2.7
1975	5.3*	20.1	.9*	4.4	6.8*	6.1

*These spring cruises were made with the Yankee #41 trawl so these values have been adjusted to the normal #36 trawl.

4. Redfish

US landings of redfish from Subarea 5 increased slightly in 1975 (Table 10).

Table 10. US redfish statistics, Subarea 5 (metric tons, round fresh).

Year	Total Subarea 5 landings	Div. 5Y (Gulf of Maine) Landings	Days fished	Landings/ days fished
1966	7,204	4,719	429	11.0
1967	10,442	6,746	649	10.4
1968	6,576	4,060	292	13.9
1969	12,038	9,637	824	11.7
1970	15,534	13,551	1,473	9.2
1971	16,267	12,541	1,695	7.4
1972	13,161	7,150	1,132	6.3
1973	11,922	7,008	1,168	6.0
1974	8,690	5,464	1,012	5.4
1975	9,075	5,961	1,362	4.4

The stock abundance index increased considerably (Table 11).

Table 11. Redfish abundance indices from US autumn survey cruises.

Year	Div. 5Y (Gulf of Maine) Wt/tow[1]	Div. 5Y (Gulf of Maine) No/tow	Subdiv. 5Ze (Georges Bank) Wt/tow	Subdiv. 5Ze (Georges Bank) No/tow
1966	69.9	96.8	4.4	11.4
1967	56.7	100.8	5.8	18.3
1968	95.3	154.7	7.7	11.3
1969	47.0	66.5	14.4	17.6
1970	74.5	96.3	10.2	13.3
1971	56.0	50.8	4.1	6.2
1972	55.0	54.8	8.5	10.8
1973	38.2	39.8	5.8	6.2
1974	58.2	51.0	4.1	6.1
1975	91.1	78.8	11.4	8.0

[1]Weight in pounds.

5. Yellowtail flounder

The US total catch of yellowtail (including discards) from Subarea 5 in 1975 was about 4,000 tons (Table 12) below that of 1974. Yellowtail landings for food took most of this loss while landings of yellowtail for industrial purposes were negligible.

Both the Southern New England and Georges Bank abundance indices were the lowest on record (Table 13).

Table 12. US yellowtail statistics, Subarea 5 (metric tons, round fresh).

Year	Food landings	Landings/ days fished	Estimated discards	Estimated industrial landings	Total catch
1966	28,656	2.0	8,253	2,364	39,273
1967	20,819	2.2	14,407	4,587	39,813
1968	28,645	3.0	10,627	3,939	43,211
1969	28,739	2.7	5,202	4,265	38,206
1970	29,825	2.5	10,689	2,095	42,608
1971	21,700	2.1	7,124	397	29,221
1972	23,886	2.1	3,100	327	27,313
1973	24,710	2.2	1,086	343	26,139
1974	23,145	1.8	993	22	24,160
1975	18,857	1.5	1,246	35	20,138

Table 13. Yellowtail abundance indices from US survey cruises.

Year	So. New England (W. of 69°) No/tow	So. New England (W. of 69°) Wt/tow[1]	Georges Bank (E. of 69°) No/tow	Georges Bank (E. of 69°) Wt/tow[1]
1963	50.6	32.1	30.1	22.0
1964	60.8	41.9	23.0	23.4
1965	38.7	28.0	15.0	15.7
1966	50.3	20.8	14.8	6.7
1967	57.7	31.0	19.2	13.0
1968	40.2	22.1	25.6	18.1
1969	54.8	31.7	23.1	16.0
1970	39.8	24.7	13.4	8.6
1971	41.7	20.2	15.2	11.0
1972	73.3	44.3	14.6	10.9
1973	7.9	5.0	13.1	9.5
1974	6.9	14.1	10.0	6.3
1975	2.9	1.6	7.7	4.0

[1]Weight in pounds.

6. Red hake

Red hake landings by US vessels from Subarea 5 in 1975 declined slightly (Table 14).

The 1975 autumn research vessel survey cruise indicated an increase in stock abundance for all three subdivisions (Table 15).

Table 14. US red hake statistics, Subarea 5 (metric tons, round fresh).

Year	Subarea 5 landings	Food fish		Industrial fish	
		Div. 5Y landings	Subdiv. 5Ze landings	Subdiv. 5Zw landings	Landings/ days fished
1966	4,280	634	845	2,801	2.3
1967	5,759	92	169	5,498	5.6
1968	6,216	82	161	5,973	7.0
1969	4,923	140	225	4,558	8.2
1970	4,281	249	100	3,932	6.3
1971	2,783	268	111	2,404	8.4
1972	1,711	373	160	1,178	-
1973	2,940	286	77	2,577	-
1974	1,887	407	81	1,399	-
1975	1,760	394	55	1,310	-

Table 15. Red hake abundance indices (mean pounds/tow) from US autumn survey cruises.

Year	Div. 5Y (Gulf of Maine) Spring	Div. 5Y (Gulf of Maine) Fall	Subdiv. 5Ze (Georges Bank) Spring	Subdiv. 5Ze (Georges Bank) Fall	Subdiv. 5Zw (So. New England) Spring	Subdiv. 5Zw (So. New England) Fall
1963	-	10.9	-	17.3	-	17.8
1964	-	1.5	-	5.8	-	9.6
1965	-	22.0	-	4.6	-	12.4
1966	-	1.6	-	33.1	-	6.4
1967	-	0.9	-	1.6	-	5.9
1968	2.0	0.3	0.6	3.0	4.3	9.7
1969	1.0	0.0	0.9	4.0	3.6	10.6
1970	0.9	0.3	1.9	2.2	5.3	8.6
1971	1.2	2.2	3.4	4.5	11.9	7.4
1972	2.9	4.1	2.4	2.6	12.2	14.6
1973	2.6*	1.3	1.3*	6.7	4.7*	6.7
1974	1.5*	1.1	0.5*	3.4	3.5*	1.2
1975	2.6*	2.2	0.9*	16.8	3.2*	9.6

*These values were obtained from spring cruises using a #41 Yankee Trawl and were adjusted to the #36 Yankee Trawl.

7. Sea herring

The US herring catch from Subarea 5 and Statistical Area 6 increased (Table 16)

The US research vessel abundance indices dropped to the lowest ever (Table 17).

Table 16. US sea herring landings from Subarea 5 (metric tons, round fresh).

Year	Subarea 5	Div. 5Y	Subdiv. 5Ze	Subdiv. 5Zw	Statistical Area 6
1966	30,589	29,365	1,224[1]	-	-
1967	31,778	31,158	620[1]	-	-
1968	42,083	41,476	9	598	-
1969	30,780	28,687	832	1,261	-
1970	30,484	29,181	272	1,031	-
1971	33,890	31,491	1,194	1,205	-
1972	40,473	38,211	11	2,251	-
1973	25,675	21,601	162	3,912	529
1974	32,392	29,356	171	2,866	278
1975	35,681	31,591	3	4,088	488

[1]Div. 5Z.

Table 17. US research cruise indices of herring abundance (mean number/tow).

Year	Autumn cruises Georges Bank	Spring cruises So. New England	Spring cruises Mid-Atlantic
1963	7.02	-	-
1964	1.13	-	-
1965	6.45	-	-
1966	10.41	-	-
1967	3.26	-	-
1968	1.36	120.6	17.4
1969	1.14	45.8	6.4
1970	0.66	34.7	1.2
1971	0.55	4.1	3.7
1972	1.06	5.7	2.6
1973	0.12	7.2	5.6
1974	0.12	2.1	1.3
1975	0.02	0.1	0.02

8. Mackerel

US mackerel landings in Subareas 5 and 6 increased from a low of 1,042 tons in 1974 to 1,660 tons in 1975, with the greatest increase occurring in SA 6 (from 567 to 1,113). US commercial landings per standardized day fished for the entire stock (Subareas 5 and 6) increased in 1975 to .53 metric tons/day, after a six-year decline to .17 in 1974. Survey abundance indices from US survey cruises indicate, however, a continual decline in stock with the spring index dropping from .31 in 1974 to .11 in 1975, and the fall index decreasing from .06 to .02.

Table 18. US mackerel statistics, Subareas 5 and 6 (metric tons, round fresh).

Year	Subarea 5 landings	Subarea 6 landings	Subareas 5&6 landings	Landings/standard US days fished SA 5&6
1964	1,264	380	1,644	0.43
1965	1,467	531	1,998	0.49
1966	1,903	821	2,724	0.84
1967	3,216	675	3,891	1.75
1968	3,001	928	3,929	2.80
1969	3,873	491	4,364	1.92
1970	3,092	957	4,049	2.07
1971	1,593	813	2,406	1.29
1972	1,025	981	2,006	0.84
1973	621	715	1,336	0.53
1974	475	567	1,042	0.17
1975	547	1,113	1,660	0.53

Table 19. Mackerel abundance indices* ($\log_e$ mean catch/tow in pounds) from US survey cruises.

Year	Spring	Fall
1965		.07
1966		.09
1967		.32
1968	.73	.17
1969	.03	.21
1970	.56	.11
1971	.52	.09
1972	.42	.11
1973	.25	.06
1974	.31	.06
1975	.11	.02

*Stratified, spring strata 1-14, 61-76; fall strata 1, 2, 5, 6, 9, 10, 13, 16, 19-21, 23, 25, 26.

9. Industrial groundfish fishery

New England landings for industrial purposes from Subarea 5 (predominantly Subdiv. 5Zw) decreased in 1975 (Table 20).

Table 20. New England groundfish landings from Subarea 5 for industrial purposes (metric tons, round fresh).

Year	Total landings	Species composition (%) for Subdiv. 5Zw				
		Silver hake	Red hake	Flounder	Eelpout	Other
1966	27,461	9.6	10.2	18.2	25.0	37.0
1967	37,400	10.2	14.7	18.5	18.9	37.7
1968	34,729	9.9	17.2	16.5	24.2	32.2
1969	26,813	9.5	17.0	21.3	20.8	31.4
1970	20,696	6.3	17.9	16.7	28.3	30.8
1971	8,823	10.1	25.8	6.6	33.7	26.3
1972	5,944	2.1	17.9	10.3	35.3	35.8
1973	11,854	7.4	20.8	10.4	26.2	35.2
1974	10,121	7.0	12.9	5.0	29.6	45.5
1975	4,250	35.8	22.2	8.8	4.9	28.3

10. Sea scallops

US sea scallop landings rose slightly in 1975 (Table 21). Because of low abundance, the number of US vessels fishing for scallops has declined significantly in recent years.

Table 21. US sea scallop statistics (metric tons of meats).

Year	Subarea 5			Statistical Area 6		
	Landings	Days fished	Landings/ days fished	Landings	Days fished	Landings/ days fished
1966	994	1,104	0.9	4,062	-	-
1967	1,309	1,870	0.7	1,873	-	-
1968	1,163	1,938	0.6	2,437	-	-
1969	1,465	2,930	0.5	851	-	-
1970	1,553	2,588	0.6	473	946	0.5
1971	1,697	3,394	0.5	274	685	0.4
1972	1,347	2,694	0.5	658	1,316	0.5
1973	1,543	2,572	0.6	238	476	0.5
1974	1,153	1,647	0.7	938	1,173	0.8
1975	1,650	2,062	0.8	1,558	1,731	0.9

B. Special research studies

1. Environmental studies

a. Hydrographic studies

In 1975 broad-scale hydrographic studies in the shelf waters of the ICNAF area were conducted primarily by NMFS and the US Coast Guard. Hydrographic observations by NMFS consist chiefly of temperature and salinity data taken on trawl and plankton surveys, whereas most US Coast Guard hydrographic stations are made on ice patrol or special cruises on coastal currents related to their search and rescue mission. A brief summary of hydrographic activity by NMFS is given in Table 22 and by the US Coast Guard in Table 23. In addition US observers participated in a number of cooperative trawl surveys with other countries in Subareas 5 and 6, where temperature profiles were taken at trawl stations as shown in Table 24. An analysis of recent bottom-water temperature changes in the Gulf of Maine and Georges Bank is presented in a research document.

The US expanded regular monitoring of hydrographic conditions in the Gulf of Maine. Since July, 1975, monthly XBT temperature transects have been made across the Gulf of Maine on the ferry "Bluenose" from Bar Harbor, Maine, to Yarmouth, Nova Scotia. In addition, a cooperative program with the US Coast Guard has provided regular hydrographic stations during spring months in the Northeast Channel (see Table 23); preliminary results are summarized in a research document. Finally, intensive water chemistry studies were carried out in spring and fall in the New York Bight area by the US National Ocean Survey.

b. Plankton studies

Inshore fishermen in the Gulf of Maine began complaining of an unusual incidence of "lipo" (Sicilian for slime) fouling their nets and reducing their catches during August 1975. This condition persisted during the fall, reached a maximum in November, and gradually declined with some still being reported in January 1976. Samples of the slime taken from the nets showed it to be an amorphous, gelatinous material with inclusions of filaments and gas-filled bladders. The inclusions were identified as tentacles, gastrozoids, and floats of a colonial siphonophore, *Nanomia cara*. Examination of several hundred plankton samples collected in the same general area during the fall also showed the presence of the slime and the inclusions. Some of the fragments in the plankton samples were identified as those of another siphonophore, *Halistemma* spp. The question as to whether the "lipo" was the undifferentiated portion of the siphonophores or the result of some other phenomena which then picked up the fragments during the tow is still unresolved.

Various aspects of phytoplankton research were conducted by the Woods Hole Oceanographic Institution (WHOI), the Bigelow Laboratory, Harvard University, State University of New York, University of Rhode Island, and the Middle Atlantic Coastal Fisheries Center. Topics included were phytoplankton distribution, bloom dynamics, genetic properties of diatoms, vitamin-B cycling, silicon accumulation in relation to light physiology, nitrogen fixation and cycling, and succession in coastal and oceanic waters. Environmental physiology of Gulf of Maine phytoplankton is being examined through periodic observations and assessments of population structure, productivity, light penetration, nitrogen uptake, carbon-14 fractionation, nature of excreted organic material, and measurement of electron transport system and ATP activity.

At WHOI, studies of zooplankton involve laboratory and field observations of feeding, behavior, distribution and symbiotic associations of siphonophores, medusae, salps and other gelatinous organisms, zooplankton patchiness, and experimental work to further clarify the role of resting eggs in species of temperate copepods which appear seasonally in neritic waters. Zoogeographic analysis of other zooplankters continues, especially of decapod larvae, stomotopod larvae, and euphausiids. The productivity of continental shelf waters off Georgia and Florida is being investigated through seasonal studies of plankton and benthos by the Skidaway Institute of Oceanography. Systematic and zoographic studies of copepods in the Gulf of Mexico and pteropods in the Sargasso Sea are being conducted at Texas A&M University.

Larval and juvenile fish

Ichthyoplankton surveys by the National Marine Fisheries Service (NMFS) and cooperating groups continued in 1975 along the Atlantic coast from the Gulf of Maine to the Florida Straits, using standard MARMAP sampling methods. Collections were made in autumn and spring from the Bay of Fundy to Cape Hatteras during groundfish surveys (NMFS, Woods Hole and Sandy Hook). In addition, six countries participated in the fifth annual ICNAF larval herring

survey (Canada, Federal Republic of Germany, German Democratic Republic, Poland, USA, USSR) covering Georges Bank and adjacent waters (see Tables 22 and 24). Sampling extended from the onset of spawning in September 1975 through larval development in March 1976. Environmental observations were more extensive in 1975-76 than in previous years and included measurements on plankton production (nutrients, chlorophyl, C^{14}, O_2, phytoplankton, zooplankton), temperature, salinity, and meteorological parameters. Comparisons of the catching efficiencies of the 0.505 and 0.333 mm mesh bongos used on the ICNAF surveys are underway at the Narragansett Laboratory. Ichthyoplankton samples are being processed at the newly established Polish Plankton Sorting Center in Szczecin, and at the Plankton Laboratory of the Northeast Fisheries Center, Narragansett, Rhode Island.

The State of South Carolina continued the monitoring of ichthyoplankton distribution and abundance from Cape Hatteras to Cape Canaveral in spring and autumn. The area from Cape Canaveral to the Florida Keys was surveyed systematically for larval tunas by the staff of the Southeast Fisheries Center, Miami. Off the Carolina coast the Atlantic Estuarine Center, Beaufort, North Carolina, continued investigations on the relationship between Ekman transport and onshore drift of larval menhaden. Correlations examined in 1975 indicate that sustained onshore drift contributes significantly to year-class strength of menhaden. The Center is also continuing an investigation of sampling variations of fish eggs and larvae. To establish a range of sample variance of fish eggs and larvae off the Carolina coast simultaneous surveys were conducted within five miles of shore and thirty-five miles offshore in cooperation with the National Science Foundation; replicate hauls were made over a six-day period.

Plankton and larval survival experiments were continued by NMFS in 1975. At the Narragansett Laboratory a bioenergetic model was completed for analysis of feeding and survival of winter flounder, *Pseudopleuronectes americanus*, larvae. Results indicate a "critical period" of survival during the 10 to 15 days following the change from endogenous to exogenous feeding. Work at Narragansett is continuing on the metabolism of larval fishes including haddock, *Melanogrammus aeglefinus*, yellowtail flounder, *Limanda ferruginea*, and scup, *Stenotomus chrysops*. *In situ* observations on the environmental conditions influencing larval survival were continued at the Southwest Fisheries Center, La Jolla. Observations were made during 1975 on the distribution of larval food patches of phytoplankton, particularly dinoflagellates, and the survival of anchovy larvae. Results indicate that larval survival depends on the stability of the oceanic regime and the aggregation of larval food organisms into dense patches. When oceanographic or meteorological conditions disrupt this stability, larvae die from lack of food.

c. Benthic studies

The Northeast Fisheries Center is conducting a cooperative investigation of the macrobenthic invertebrate fauna of the Middle Atlantic Bight with the US Geological Survey and the Woods Hole Oceanographic Institution. Some 600 quantitative grab samples were taken in waters from 3 to 3,100 meters depth. The occurrence of all taxonomic groups will be related to such environmental characteristics as water depth, temperature, sediment particle size, sediment organic matter, and geographic distribution.

The research submersible *Alvin* was used by the Northeast Fisheries Center to continue studies of the geological and biological characteristics of the canyons of the continental shelf off New England with special emphasis on the distribution and ecological relationships of the megabenthic crustacea.

d. Trawl surveys

Standard spring and fall groundfish surveys were conducted in 1975 from Cape Hatteras to Nova Scotia, again in cooperation with the Middle Atlantic Coastal Fishery Center (MACFC), Sandy Hook, New Jersey. Additional trawl surveys for demersal fishes were carried out by MACFC in the New York Bight area in conjunction with studies of ocean dump sites. A general survey of sea scallop distribution from Cape Hatteras to Georges Bank was also conducted in 1975. All these surveys by US vessels are summarized in Table 22.

Five cooperative trawl surveys on vessels of other countries were conducted in 1975, to document distribution and abundance of juvenile herring and mackerel, hake and squid (Table 24). Data were recorded for all species on these surveys as for the standard spring and fall trawl series.

e. Other environmental studies

Food habits of 17 selected species of fish were recorded again in 1975 to continue the monitoring of annual variations and diet trends for these indicator species. Preliminary summaries of the previous food habits studies on fishes were presented in Res. Doc. 75/IX/130.

2. Biological studies by species

Gadoids and selected species

As in past years, maturity stages were recorded for selected species sampled on spring and fall surveys, with emphasis on cod, haddock, pollock, and yellowtail flounder. Spawning stock of haddock on Georges Bank again was heavily dependent on the 1972 year-class, which represented over half of the mature females.

3. Gear and selectivity studies

a. Trawl standardization

The headrope height, wingspread, and stability of all bottom trawls to be used during the groundfish surveys were measured acoustically at several water depths, vessel speeds, scopes, and directions of tow. In all, 33 days were spent at sea on two different NMFS vessels to collect these data needed to standardize the performance of the sampling gear.

b. Joint US-USSR trawl comparisons

The experiment was designed to compare the relative fishing power, by species, of two different vessels, *Belogorsk* (USSR) and *Albatross IV* (USA). This was the third in a series of comparisons to develop relative efficiency factors between trawls and between vessels that can be used to standardize the catches made on joint surveys.

4. Miscellaneous studies

The Northeast Fisheries Center in cooperation with diver-scientists from the Federal Republic of Germany and Poland conducted a three-month study of the ecology of herring spawning beds using saturation diving techniques from the underwater habitat *Helgoland* (FRG) on Jeffreys Ledge in the Gulf of Maine. The diving teams also conducted experiments on the hydroacoustic characteristics of various species of fish, fish-trapping techniques, fish behavior, and the advancement of the technology of scientific diving in boreal waters.

Table 22. Biological and hydrographic survey activity by NMFS in the ICNAF area in 1975.

Cruise	Dates	Purpose	Biological stations		Temp-Sal profiles		Major area
			Trawl	Plankton	BT	STD or Nansen	
ALB 75-2	12-27 Feb	Larval herring	-	86	113	25	Georges Bank
ALB 75-3	4 Mar - 12 May	Spring groundfish	323	190	358	-	Hatteras to Nova Scotia
ALB 75-4	1-10 Apr	Demersal fish	48	22	72	-	NY Bight
DEL 75-5	5-16 May	Demersal fish	63	31	98	6	NY Bight
ALB 75-5	12-22 May	Juvenile fish	-	67	67	22	Georges Bank
DEL 75-6	19-23 May	Demersal fish	37	-	37	-	Mid-Atlantic
DEL 75-8	2-9 May	Demersal fish	64	131	101	6	NY Bight
ALB 75-7	8-18 July	Hydrographic	-	18	250	74	Georges Bank
ALB 75-8	7-16 Aug	Scallop	100(dredge)	-	103	-	Mid-Atlantic
CHALLENGE	4-9 Sep	Larval herring	-	22	22	-	Gulf of Maine
DEL 75-14	8-19 Sep	Demersal fish	90	30	128	37	NY Bight
DEL 75-15	12 Sep - 2 Oct	Larval herring	-	84	87	27	Gulf of Maine
ALB 75-11	23 Sep - 3 Oct	Scallop	144(dredge)	-	111	-	Georges Bank
ALB 75-12	7 Oct - 18 Nov	Autumn groundfish	230	207	258	-	Georges Bank & Gulf of Maine
DEL 75-17	15 Oct - 7 Nov	Autumn groundfish	190	83	190	-	Mid-Atlantic
ALB 75-13	28 Oct - 5 Nov	Larval herring	-	48	48	26	Jeffreys Ledge
ALB 75-14	2-19 Dec	Larval herring	-	93	95	83	Georges Bank
DEL 75-19	1-18 Dec	Demersal fish	181	1	181	181	Mid-Atlantic

Table 23. 1975 hydrographic activity by US Coast Guard in ICNAF area.

Period	Purpose	Level of activity	Area
Feb, Aug, Nov	North Atlantic circulation	13 sections, about 200 STD-Nansen stations A2(3), A3(5), A4(3), A5(2)	Gulf of Maine to Labrador
Apr-Jul	Ice patrol	10 sections	Grand Bank
Aug, Jan	Search & rescue	45 STD-Nansen stations	Mid-Atlantic
Jan-Apr, Aug-Dec	HOTEL (weather station)	118 Nansen casts, about 500 XBT	38°N 71°W
28 Feb-31 May	High-seas abstention area patrol	7 sections, 56 Nansen	NE Channel Gulf of Maine

Table 24. 1975 cooperative trawl surveys with other countries in SA 5, 6.

Cruise	Dates	Purpose	Stations				Area
			Trawl	Plankton	BT	STD	
WIECZNO 75-1 (Poland)	2-16 Mar	Larval-Juvenile herring and mackerel	55	22	55	-	Southern New England
E. HAECKEL 38 (GDR)	11-17 Mar	Juvenile herring and mackerel	33	-	33	-	Nantucket-SW Georges Bank
W. HERWIG 75-1 (FRG)	11-26 Mar	Larval-Juvenile herring and mackerel	77	60	77	-	Southern New England-Georges and Browns Bank
BELOGORSK 75-10 (USSR)	9-26 Aug	Hake survey	98	-	98	-	Nova Scotia-Hudson Canyon
CRYOS 75-1 (France)	21 Nov-11 Dec	Squid survey	46	-	46	-	N. Georges Bank-Delaware Bay